

CLAIM AMENDMENTS

1. (Original) A method of bandwidth optimization for a constant bit rate packetized transport stream having N program streams, each program stream being broken into groups of pictures, comprising the steps of:

determining a number of available bits for each group of pictures from each program stream;

inserting each group of pictures into the constant bit rate packetized transport stream when the number of bits for said group of pictures is less than or equal to the number of available bits for said group of pictures; and

transrating each group of pictures when the number of bits in said group of pictures is greater than the number of available bits for said group of pictures so that the total number of bits in the groups of pictures is less than or equal to the total number of available bits; and

inserting each transrated group of pictures into the constant bit rate packetized transport stream.

2. (Original) The method as recited in claim 1 wherein the determining step comprises the steps of:

selecting a region of consideration to include at least one complete group of pictures from each of the program streams;

determining the total number of bits for the complete groups of pictures within the region of consideration;

comparing the total number of bits with an initial number of available bits for the region of consideration;

borrowing bits for addition to the initial number of available bits if the total number of bits is greater than the initial number of available bits to obtain a total number of available bits, and

allocating the total number of available bits among the groups of pictures in the region of consideration as the number of available bits for each group of pictures.

3. (Original) The method as recited in claim 2 wherein the borrowing step comprises the steps of:

placing a number of data bits available within the region of consideration into a borrow bit pool; and

adding bits from the borrow bit pool to the initial number of available bits until the total number of available bits equals the total number of bits or the bits in the borrow bit pool are exhausted.

4. (Original) The method as recited in claim 2 wherein the borrowing step comprises the steps of:

determining a number of bits to borrow from a next region of consideration;

placing the determined number of bits into a borrow bit pool; and

adding bits from the borrow bit pool to the initial number of available bits until the total number of available bits equals the total number of bits or the bits in the borrow bit pool are exhausted.

5. (Original) The method as recited in claim 4 wherein the borrowing step further comprises the step of placing a number of data bits available within the region of consideration into the borrow bit pool prior to the adding step.

6. (Original) The method as recited in claim 2 wherein the allocating step comprises the step of reducing the number of available bits for each group of pictures within the region of consideration by an equal percentage until the total number of available bits for the groups of pictures equals the total number of available bits within the region of consideration.

7. (Currently Amended) The method as recited in claim 2 wherein the allocating step comprises the steps of:

identifying a priority program among the program streams; and  
reducing the number of available bits for each group of pictures except those within the priority program by an equal percentage until the total number ~~of available~~ of available bits for the groups of pictures equals the total number of available bits for the region of consideration.

8. (Currently Amended) The method as recited in claim 1 wherein the transrating step comprises the steps of:

determining a rate reduction amount for each program stream;  
comparing the rate reduction amount with a first threshold for each program stream;

performing transrating in a compressed domain for the program streams where the rate reduction amount is less than a ~~specified~~ specified value; and

performing transrating in a pixel domain for the program streams where the rate reduction is more than the specified value.

9. (Original) The method as recited in claim 8 wherein the transrating step further comprises the steps of:

deleting a program stream from the outgoing MTS if specified by a subscriber profile when the rate reduction amount is so high as to cause unacceptable degradation; and

repeating the above steps for the reduced number of program streams.

10. (Currently Amended) The method as recited in claim 8 wherein the performing transrating in the compressed domain step comprises the steps of:

zeroing high spatial frequency coefficients if the rate reduction amount is less than a first threshold for the specified value; and

~~requantizing~~ requantizing the coefficients if the rate reduction amount is greater than the first threshold and less than a second threshold for the specified value, transrating in the pixel

domain occurring when the rate reduction amount is greater than the second threshold.

11. (New) A method of operating a network having a wide bandwidth backbone and a narrower bandwidth branch from the backbone to an end user location for delivering a constant bit rate packetized transport stream to the end user location, said method comprising:

selecting N transport streams each composed of groups of pictures,

determining a number of available bits for each group of pictures from each program stream,

and

if the number of bits for each group of pictures of a program stream is less than or equal to the number of available bits for a group of pictures of that stream, inserting the group of pictures into the constant bit rate packetized transport stream,

else

transrating the group of pictures so that the number of bits for the transrated group of pictures is less than or equal to the number of available bits for a group of pictures of that stream, and inserting the transrated group of pictures into the constant bit rate packetized transport stream,

whereby use of the bandwidth of the network branch is optimized.

12. (New) The method as recited in claim 11 wherein the determining step comprises the steps of:

selecting a region of consideration to include at least one complete group of pictures from each of the program streams;

determining the total number of bits for the complete groups of pictures within the region of consideration;

comparing the total number of bits with an initial number of available bits for the region of consideration;

borrowing bits for addition to the initial number of available bits if the total number of bits is greater than the initial number of available bits to obtain a total number of available bits, and allocating the total number of available bits among the groups of pictures in the region of consideration as the number of available bits for each group of pictures.

13. (New) The method as recited in claim 12 wherein the borrowing step comprises the steps of:

placing a number of data bits available within the region of consideration into a borrow bit pool; and

adding bits from the borrow bit pool to the initial number of available bits until the total number of available bits equals the total number of bits or the bits in the borrow bit pool are exhausted.

14. (New) The method as recited in claim 12 wherein the borrowing step comprises the steps of:

determining a number of bits to borrow from a next region of consideration;

placing the determined number of bits into a borrow bit pool; and

adding bits from the borrow bit pool to the initial number of available bits until the total number of available bits equals the total number of bits or the bits in the borrow bit pool are exhausted.

15. (New) The method as recited in claim 14 wherein the borrowing step further comprises the step of placing a number of data bits available within the region of consideration into the borrow bit pool prior to the adding step.

16. (New) The method as recited in claim 12 wherein the allocating step comprises the step of reducing the number of available bits for each group of pictures within the region of

consideration by an equal percentage until the total number of available bits for the groups of pictures equals the total number of available bits within the region of consideration.

17. (New) The method as recited in claim 12 wherein the allocating step comprises the steps of:

identifying a priority program among the program streams; and  
reducing the number of available bits for each group of pictures except those within the priority program by an equal percentage until the total number of available bits for the groups of pictures equals the total number of available bits for the region of consideration.

18. (New) The method as recited in claim 11 wherein the transrating step comprises the steps of:

determining a rate reduction amount for each program stream;  
comparing the rate reduction amount with a first threshold for each program stream;

performing transrating in a compressed domain for the program streams where the rate reduction amount is less than a specified value; and

performing transrating in a pixel domain for the program streams where the rate reduction is more than the specified value.

19. (New) The method as recited in claim 18 wherein the transrating step further comprises the steps of:

deleting a program stream from the outgoing MTS if specified by a subscriber profile when the rate reduction amount is so high as to cause unacceptable degradation; and

repeating the above steps for the reduced number of program streams.

20. (New) The method as recited in claim 18 wherein the performing transrating in the compressed domain step comprises the steps of:

a<sup>2</sup>      zeroing high spatial frequency coefficients if the rate reduction amount is less than a first threshold for the specified value; and

requantizing of the coefficients if the rate reduction amount is greater than the first threshold and less than a second threshold for the specified value, transrating in the pixel domain occurring when the rate reduction amount is greater than the second threshold.